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SPECIFICATION

A thread-implanting machine

TECHNICAL FIELD

This invention relates to a thread-implanting machine to implant a number of threads into the base cloth and produce carpets and mats, etc.

BACKGROUND ART

For the thread-implanting machine of the base cloth, refer to Figure 12 for the explanation of producing a carpet.

Figure 12 shows the cross-section drawing, and to produce a carpet, implant thread 101 into base cloth 100 at a prescribed pitch while cutting every thread loop as well as implanting the thread 101 into the base cloth100.

A needle 105 that moves up and down is placed in the body of the thread-implanting machine (not shown in the figure) and the thread 101 from a stock bobbin (not shown in the figure) is inserted through a pinhole 105a that is at the tip of the needle 105. In addition, a pivot shaft 107 is placed underneath the needle 105 that oscillates by an oscillating mechanism (not shown in the figure) in response to the vertical movement of said needle 105, and an L-shaped shuttle hook 108 is attached to this pivot shaft 107. A sharp point 108a of this shuttle hook 108 is inserted into an after-mentioned thread loop that is formed by the thread 105, and a cutting blade 108b is placed underneath the point 108a. Moreover, a thread cutting blade 112 that is able to slide against the cutting blade 108b of said shuttle hook 108 moves up and down using an ascending-descending shaft 113 as a supporting point in response to the vertical movement of said needle 105.

Subsequently, for the mechanism of the needle 105, the shuttle hook 108 and the thread cutting blade 112 of said structure, refer to Figure 12 for the explanation of the process of implanting the thread 101 into the base cloth 100.

(1) The needle 105 runs through the base cloth 100 from the top dead center and hits the lowest point through an ascending-descending apparatus (not shown in the figure) of the needle 105. At this time, the point 108a of the L-shaped shuttle hook 108 moves close to the thread 101 by the oscillating mechanism (Figure 12 (A)).

(2) Subsequently, when the needle 105 starts moving up, the thread 101 inserting through the pinhole 105a loosens and forms a thread loop. Then, by said oscillating mechanism, the point 108a of the L-shaped shuttle hook 108 is inserted into the thread loop of the thread 101 (Figure 12 (B)).

(3) Moreover, when the needle 105 moves up, the length (distance) of the thread 101 between the base cloth 100 and the needle 105 is maintained at a certain length by the point 108a of the L-shaped

shuttle hook 108 that stays at the same position, and the needle moves further up and hits the top dead center above the base cloth 100. When the needle 105 hits the top dead center, the thread cutting blade 112 moves up and the thread is cut by the thread cutting blade 112 and the cutting blade 108b that is formed on said shuttle hook 108 (Figure 12 (C)).

After that, the thread 101 is implanted into the base cloth 100 and carpets etc. are produced by repeating said (1) to (3) with the base cloth 100 being moved by 1 pitch.

However, because it repeats the operation of stopping, oscillating, stopping and waiting to cut, cutting the thread, oscillating back to the original position and stopping by the oscillating movement of said shuttle hook 108, there is an impact shock at the time of stopping the oscillation when this sequence of operation is performed at high speeds, thus improvements on the noise problem are desired.

## DISCLOSURE OF THE INVENTION

The needle on the thread-implanting machine of this invention has thread through its pinhole and runs up and down through the surface and undersurface of base cloth. In addition, the hook shaft turns in response to the vertical movement of this needle. Then, the turning hook, which has the turning hook blade and is attached to the hook shaft, and the ascending-descending blade by the turn of said hook shaft, cuts the thread, and sequentially, the thread is implanted. Therefore, because the turning hook (turning hook blade) cuts the thread with the ascending-descending blade while implanting, the noise is reduced.

Moreover, because the ascending-descending blade that is used for the thread-implanting machine of this invention has a mechanism that it moves up and down by the eccentric cam that is attached to the turning shaft or the eccentric cam that is placed on the outside of the hook shaft and synchronizes with the hook shaft, it can be easily configured.

In addition, because the thread-implanting machine of this invention has a rotary vane ,attached, it can prevent the accumulation of thread waste and makes it possible to stitch at high speeds.

## BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is the overall view of the thread-implanting machine.

Figure 2 is a drawing of the components underneath the needle.

Figure 3 is a drawing that shows the process of thread implantation.

Figure 4 is a drawing that shows the process of thread implantation.

Figure 5 is a drawing that shows the process of thread implantation.

Figure 6 is a drawing that shows the process of thread implantation.

Figure 7 is a drawing that shows the process of thread implantation.

Figure 8 is a drawing that shows the process of thread implantation.

Figure 9 is a cross-section drawing of implantation into the base cloth.

Figure 10 is a drawing of the components of the thread-implanting machine that the rotary vane is attached.

Figure 11 shows the other ascending-descending mechanism of the ascending-descending blade.

Figure 12 is the basic concept of an existing thread-implanting machine.

## BEST EMBODIMENT OF THE INVENTION

Explaining this invention in greater detail.

For the thread-implanting machine that produces carpets etc. by implanting into base cloth, refer to Figure 1 that shows the entirety and Figure 2 that shows components underneath the needle 51.

The ascending-descending mechanism that the needle 51 runs up and down through the surface 54a and the undersurface 54b of the base cloth 54 is built in the body of the thread-implanting machine 50, and thread 55 from the stock bobbin 52 is inserted through the pinhole 51a that is formed on the tip of this needle 51.

Moreover, there is the hook turning extension arm 60 underneath the body of the thread-implanting machine 50, and the hook shaft 6 that turns in synchronization with the ascending-descending mechanism of said needle 51 is placed on the inside of this hook turning extension arm 60. In other words, it is a cycle in which the rotation is made from the top dead center of the needle 51 (on the surface of the implanting cloth 54) to the bottom dead center of the needle 51 (on the undersurface of the implanting cloth 54) to the top dead center of the needle 51 (on the surface of the implanting cloth 54) .

The turning hook 1, which is semicircular, is composed of an arm part 7 that is placed extending towards the exterior edge from the center and a falcate hook 4 that extends on a quasi-half circle from this arm part 7, and an inductive groove 3 is formed between this hook 4 and the arm part 7. Then, this turning hook 1 is connected to the hook shaft 6 in the center part.

Additionally, the sharp point 2 of the hook 4 is able to insert into a thread loop that is formed by the later-mentioned thread 55c and thread 55w, and this thread 55 of the thread loop that has the hook inserting through is induced to a turning hook blade 5, which is one side of scissors that cut the thread 55 and are placed on the inside that is close to the arm part 7 of the hook 4, accompanying the turn of shuttle hook 1.

Moreover, an eccentric cam 8 that is in close contact with said arm part 7 is attached to said hook shaft 6. On the other hand, a plate-like ascending-descending blade 10 that is oscillatable is attached to a supporting shaft 10j by a spring 11 in the state where it is always placed on said eccentric cam. Then, a cutting blade 10a that is formed at the upper end of the ascending-descending blade 10 comprises the other side of the scissors for said shuttle hook blade 5.

Thus, turning hook 1 and eccentric cam 8 turn counterclockwise in synchronization with the vertical movement of the needle 51, and ascending-descending blade 10 moves up by the eccentric cam 8, and said turning hook blade 5 and the ascending-descending blade slide against each other, and cut thread as scissors.

Next, the process of sequentially implanting into the base cloth 54 accompanying the vertical

movement of the needle 51 will be described with reference to Figure 3-8.

The positions of the vertical movement of the needle 51 is defined as sinθ function depending on the turning angle of the shuttle hook 1, and the positions of the needle 51 and the point 2 of the turning hook 1 are recreated with a high degree of accuracy.

In addition, the hook shaft 6 makes one rotation with the cycle of needle 51, which is from the top dead center (on the surface 54a) to the bottom dead center (on the undersurface 54b) to the top dead center (on the surface 54a), and the needle 51 runs up and down through the surface 54a and the undersurface 54b of the base cloth 54, and thread 55 is cut by the turning hook blade 5 of the turning hook and the ascending-descending blade 10 and sequentially implanted into the base cloth 54 by a pitch (P).

(1) Figure 3 shows that the needle 51 that has thread 55 through its pinhole 51a is on the surface 54a of the base cloth 54 and is going down from the top dead center and also shows the state immediately before the pinhole 51a sticks into the base cloth 54.

In addition, thread 55 that is threaded in the pinhole 51a is connected to a stock bobbin 52, and with regard to the dropping of the needle 51, there is no sliding of thread 55 that is restrained by the pinhole 51a and the needle 51 and thread 55 moved down together. Moreover, the slackness of thread 55a is equivalent to the length of one implanted piece of thread, and with the downward movement of needle 51, the length of one implanted piece of thread is pulled from the stock bobbin 52.

(2) Figure 4 shows the state that needle 51 drops further and needle 51 has run through base cloth 54 and is under the undersurface 54b and has hit the bottom dead center. In addition, thread 55c and 55w that are through the pinhole 51a are under tension of the friction of the base cloth 54 and closely attaching to needle 51.

(3) Figure 5 shows that needle 51 moves slightly up from the bottom dead center, and the thread 55c and 55w at the tip of the needle loosen and also make a thread loop that spreads to the both sides of pinhole 51a, and at the same time, point 2 of the turning hook inserts into the thread loop accompanying the turn of the turning shaft 6 and the thread is hooked by the hook 4.

In addition, because the thread loop of the thread 55 is hooked by the hook 4, this thread loop does not come through to the surface of the base cloth 54 even if needle 51 moves up.

(4) Figure 6 shows that the shuttle hook has caracoled from the state figure 3, and the needle 51 is moving up through base cloth 54, and thread 55c and 55w are maintained by the hook 4, and thread 55 is moved up to the surface of base cloth 54 accompanying the upward movement of needle 51 while the thread loop that is formed with thread 55c and 55w is straightened.

(5) Figure 7 shows that needle 51 has moved further up and almost hits the top dead center, the thread loop slides to the turning hook blade 5 held by the hook 4, and needle 51 is being pulled upward with thread 55d sliding through pinhole 51a, and the thread 55d is put into a state of tension.

In addition, it shows that ascending-descending blade 10 moves up by eccentric cam 8 that is attached to hook shaft 6, and this is immediately before this ascending-descending blade 10 and the turning hook blade 5 of the turning hook 1 cut thread 55.

(6) In Figure 8, needle 51 hits the top dead center, and the turning hook blade 5 and ascending-descending blade 10 move to the highest position, slide against each other, become scissors and cut thread 55c and 55w, and one cycle is completed. Then, the base cloth 54 is moved by one pitch (P), and the next thread implantation is prepared.

In addition, the timing to move said base cloth 54 by one pitch (P) is while the needle 51 is above the surface of the base cloth 54.

Figure 9 (A) shows the implanted thread that has been implanted into the base cloth 54 when said cycle from (1) to (6) is sequentially performed using one piece of the thread 55, and each piece of implanting thread is cut into 55g and 55h and is implanted. Additionally, Figure 9 (B) shows the state of one implanted thread, and shows the thread implantation state in which the thread is divided into two pieces on the undersurface of base cloth 54.

In addition, there is an explanation of an example that one piece of thread 55 is inserted through pinhole 51a, however, several pieces of thread can be inserted through pinhole 51a and implanted. For example, if three pieces of thread are inserted through pinhole 51a, and said cycle (1) – (6) is performed, they are divided into three and three pieces as shown in Figure 9 (C), which means that it can implant 6 pieces at a time.

As seen above, because the thread-implanting machine of this invention cuts thread with turning hook blade 5 and ascending-descending blade 10 when turning hook 1 turns, it moves smoothly unlike the oscillating movement of existing shuttle hooks and is able to implant quietly.

In addition, although ascending-descending blade 10 is a simple mechanism that moves up by eccentric cam 8, it can be comprised to oscillate as existing one and cut thread with the shuttle hook blade 5.

Moreover, Figure 10 shows the components underneath the needle 51 that have another structure, but a component that is different from the thread-implanting machine shown in Figure 2 is rotary vane 40. Additionally, a turning hook 1A is a discotic that has falcate hook 4 and the turning hook blade 5 and has a different shape than said turning hook 1, but it has the same function.

The rotary vane 40 is attached to the back of said ascending-descending blade 10 on the hook shaft 6, and blades 41 are attached to this rotary vane 40, and it turns along with the turn of hook shaft 6 and blows winds forwards (to the direction of ascending-descending blade 10) to cool the scissor part that is composed of ascending-descending blade 10 and the turning hook blade 5 as well as

preventing thread waste from adhering and piling up.

In addition, this thread waste is made by the friction generated when the thread 55 goes through small pinhole 51a, and the thread that goes through the small pinhole is peeled into micro fibers and scattered around, and this thread waste wraps around the turning hook 1 and, if left unattended, it becomes unable to operate.

Moreover, with regard to the cutting by turning hook blade 5 and the ascending-descending blade 10, because turning hook blade 5 and ascending-descending blade 10 cut thread by sliding against reciprocal , the turning hook blade 5 and ascending-descending blade 10 will burn due to frictional heat if the machine operates for a long time at high speed and is left unattended.

In this way, it is possible to prevent the accumulation of thread waste and the turning hook blade 5 and the ascending-descending blade 10 from burning and to continuously perform for a long time at high speeds by attaching the rotary vane 40 to the hook shaft 6.

In addition, this rotary vane 40 can be attached to the hook shaft that oscillates as well as the turning shaft 6 that turns to one direction, and it goes without saying that it is possible to apply this to various sorts of sewing machine etc. as well as thread-implanting machine. For example, the thread 55 is inserted through pinhole 51a, and base cloth 54 is sewn by needle 51 that runs up and down through the surface and undersurface of base cloth 54 and the bobbin thread (not shown in the figure), in other words, for the thread-implanting machine that does not cut thread 55, because the accumulated thread waste can be removed by the winds from rotary vane 40 that is attached to a shaft that turns in one direction or oscillates, it is possible to stitch at high speeds.

Subsequently, Figure 11 is a front elevation view that shows the other ascending-descending mechanism of ascending-descending blade 10A, and the structure has a different position of eccentric cam 8 from the one shown in Figure 2.

A cam shaft 30 is placed on the outside of a turning hook 1A, and this cam shaft 30 and the hook shaft 6 have turning conduction in equal ratio by a wheel and are synchronized with each other, and an eccentric cam 31 is attached to cam shaft 30, and the ascending-descending blade 10A moves up by this eccentric cam 31. In other words, the eccentric cam 31 is placed on the outside of the hook shaft 6. Moreover, this ascending-descending blade 10A is supported roughly in the center by a pivot shaft 33, and a U-shaped fitting part 10b that is formed on the heel of the ascending-descending blade 10A slides over the eccentric cam 31 and connects to it.

Therefore, as the turning hook 1A turns on the shuttle shaft 6, the ascending-descending blade 10A is moved up (oscillates) by eccentric cam 31 on the cam shaft 30, and said turning hook blade 5 and the cutting blade 10a cut thread 55.

In this way, the ascending-descending blade 10A can be configured so that it can be moved up (oscillatable) by the eccentric cam 31 that is attached to the cam shaft 30 that is placed on the outside

of the turning hook 1 as well as being comprised to attach the eccentric cam 8 to the hook shaft 6 shown in Figure 2.